

Appl. No. 10/038,018
Amdt. dated Feb. 11, 2004
Reply to Office action of Jan. 08, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-12 (canceled)

Claim 13 (currently amended): A method of removing contaminants from a fluid column, comprising the steps of:

providing a housing defining an interior chamber established by a fluid impervious boundary wall with an inner surface and having inlet and outlet ports;

providing a plurality of contaminant separation sectors, each contaminant separation sector comprising a pair of electrodes, each electrode comprising a plurality of parallel, spaced-apart plates coupled to a common buss bar and wherein the spacing between the plates is uniform, the plates of the electrodes interleaving and forming a series of cavities to define a flow path from the inlet port to the outlet port of the housing;

placing said plurality of contaminant separation sectors in a substantially coplanar arrangement within the interior chamber of the housing such that the electrodes of the contaminant separation sectors are arranged in substantially parallel oriented along planes and in distinct layers;

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introducing a feed stream of contaminants carried within a fluid column to the inlet port of said housing to establish a flow of the fluid column carrying the contaminants through the housing along the defined flow path;

applying electrical energy to the electrodes of the contaminant separation sectors to produce an electric field that causes contaminants carried within a feed stream to separate from the fluid column; and

discharging as a processed feed stream the fluid exiting from the outlet port of the interior chamber of the housing.

Claim 14 (previously presented): The method according to claim 13 further comprising the steps of:

replacing the electrodes; and

disposing of the solidified contaminants.

Claim 15 (previously presented): A method according to claim 13 wherein the electrodes comprise an electrically conductive material.

Claim 16 (previously presented): A method according to claim 13 wherein the cavities formed between the interleaved parallel plates of the electrodes define distinct contaminant separation units.

Claim 17 (previously presented): A method according to claim 13 wherein said contaminant separation sectors are arranged within the housing to create a flow path therethrough.

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Claim 18 (currently amended): An apparatus for removing contaminants from a fluid column, comprising:

a housing defining an interior chamber established by a fluid impervious boundary wall with an inner surface and having inlet and outlet ports;

a first contaminant separation sector and a second contaminant separation sector mounted within the interior chamber of the housing, each contaminant separation sector comprising a pair of electrodes, each electrode comprising a plurality of parallel, spaced-apart plates coupled to a common buss bar and wherein the spacing between the plates of each contaminant separation sector is uniform;

said first and second contaminant separation sectors being mounted in a substantially coplanar arrangement within the interior chamber of the housing such that the electrodes of the contaminant separation sectors are arranged in substantially parallel oriented along planes and in distinct layers, the plates of the electrodes interleaving and forming a series of cavities to define a along the flow path from the inlet port to the outlet port of the housing; and

an electric power supply coupled to the electrodes to produce an electric field acting within the series of cavities to separate contaminants carried within a feed stream from a fluid column being directed along the flow path.

Claim 19 (previously presented): The apparatus of claim 18 wherein the electrode plates of the first contaminant separation sector are in closer proximity to one another in their uniform spacing than the electrode plates of the second contaminant separation sector in their uniform spacing so that the volume of the cavities in the first contaminant separation

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sector is greater than the volume of the cavities in the second contaminant separation sector along the flow path through the housing from the inlet port to the outlet port.

Claim 20 (previously presented): The apparatus of claim 18 wherein the fluid flow path extends substantially parallel to the surface of each electrode plate.

Claim 21 (previously presented): The apparatus of claim 18 wherein the electrodes comprise an electrically conductive material.

Claim 22 (previously presented): The apparatus of claim 21 wherein the electrically conductive material comprising the electrode plates of the first contaminant separation sector is different from the electrically conductive material comprising the electrode plates of the second contaminant separation sector so that different electrically conductive materials comprise each contaminant separation sector along the flow path through the housing from the inlet port to the outlet port.

Claims 23-24 (canceled)

Claim 25 (previously presented): The apparatus of claim 18 wherein the fluid flow path extends substantially orthogonal to the direction of the electrical field that is established between opposing electrode plates.

Claim 26 (previously presented): The apparatus of claim 18 wherein the electrical power supply comprises a direct current source having first and second electrical terminal connections, each terminal connection being coupled to the contaminant separation sectors.

Claim 27 (previously presented): The apparatus of claim 26 wherein the contaminant separation sectors are connected in series to the electrical power supply.

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Claim 28 (previously presented): The apparatus of claim 26 wherein the contaminant separation sectors are connected in parallel to the electrical power supply.

Claim 29 (previously presented): The apparatus of claim 18 further comprising a static mixing apparatus disposed within the housing in a substantially perpendicular orientation to the direction of flow through the housing.

Claim 30 (previously presented): The apparatus of claim 29 wherein static mixing apparatus redirects the flow of a fluid from the internal periphery of the housing to the electrodes of the contaminant separation sectors.

Claim 31 (currently amended): A method of removing contaminants from a fluid column, comprising the steps of:

providing a magnetic field generator defining a length of conduit having a fluid impervious boundary wall with an inner surface and an outer surface and having a fluid entry port and a fluid discharge port, a segment of said conduit being encircled by an electrical conductor, said electrical conductor having first and second conductor leads, the electrical conductor being coiled around a segment of said conduit to form a first layer of coiled electrical conducting material and a second layer of coiled electrical conducting material, said layers of a coiled electrical conducting material being disposed coaxially and spaced apart from one another by a pattern of spacers and forming a plurality of open-air cooling ducts between coaxially disposed and spaced apart layers of electrical conductor;

connecting the first and second conductor leads of the electrical conductor to an electrical power supply to produce an electromagnetic field within the inner surface of the fluid impervious boundary wall of the conduit;

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providing a plurality of electrodes, each electrode comprising a plurality of parallel, spaced-apart plates coupled to a common buss bar, said electrodes paired to form distinct fluid treatment units;

providing a housing defining an interior chamber established by a fluid impervious boundary wall with an inner surface and having inlet and outlet ports;

placing said plurality of electrodes within the interior chamber of the housing as opposing electrodes, the plates of the electrodes being oriented along parallel planes so that the plates of the electrodes interleave to define a flow path from the inlet port to the outlet port;

introducing a feed stream of contaminants carried within a fluid column to the inlet port of the conduit to establish a flow of the fluid column carrying the contaminants through the conduit;

directing the flow entering the inlet port of the conduit to pass through the electromagnetic field along a path extending through and substantially orthogonal to each turn of the electrical conductor forming the first and second coil layers;

discharging the fluid exiting from the outlet port of the conduit as a processed feed stream suitable for contaminant separation;

introducing a feed stream of contaminants carried within a fluid column to the inlet port of said housing to establish a flow of the fluid column carrying the contaminants through the housing along the defined flow path;

applying electrical energy to the electrodes to produce an electric field that causes contaminants carried within a feed stream to separate from the fluid column pass flow through the cavities along the flow path substantially

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~~orthogonal to the electrical field established between opposing electrode plates;~~
and

discharging as a processed feed stream the fluid exiting from the outlet port of the interior chamber of the housing.

Claim 32 (currently amended): The method according to claim 31 further comprising the steps of:

replacing the electrodes; and

disposing of the solidified contaminants.

Claim 33 (previously presented): The method of claim 31 wherein the electrical conductor coil layers induce a magnetic field to which fluid passing through the conduit is exposed.

Claim 34 (previously presented): The method of claim 31 wherein the supply of electrical power is of sufficient magnitude to induce a magnetic field to fluid passing through the conduit.

Claim 35 (previously presented): A method according to claim 31 wherein the electrodes comprise an electrically conductive material.

Claim 36 (canceled)